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| 10/575,246 | 12/11/2006 | Ge Ming Lui | 404339 | 6963 |

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| EXAMINER | |
|---|---|
| WANG, CHANG YU | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1649 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/575,246 | LUI, GE MING | |
| | Examiner | Art Unit | |
| | Chang-Yu Wang | 1649 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *07 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *11-17,27 and 28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-17,27 and 28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

## RESPONSE TO AMENDMENT

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/7/09 has been entered.

### *Status of Application/Amendments/claims*

2. Applicant's amendment filed 5/7/09 is acknowledged. Claims 1-10 and 18-26 are cancelled. Claims 11, 13-15 are amended. Claims 27 and 28 are newly added. Claims 11-17 and newly added claims 27-28 are pending in this application and under examination in this office action.

3. Any objection or rejection of record, which is not expressly repeated in this office action, has been overcome by Applicant's response.

4. Applicant's arguments filed on 5/7/09 have been fully considered but they are not deemed to be persuasive for the reasons set forth below.

### *Claim Rejections/Objections Withdrawn*

5. The objection to claims 13 and 15 is withdrawn in response to Applicant's amendment to the claims.

The rejection of claims 11-17 under 35 U.S.C. 112, second paragraph, as being indefinite is withdrawn in response to Applicant's amendment to the claims by reciting SEQ ID NO:1.

The rejection of claims 11-12 and 17 under 35 U.S.C. 102 (b) as being anticipated by US Patent No. 5827641 (Parenteau et al. issued on Oct 27, 1998) is withdrawn in response to Applicant's amendment to the claims and arguments on p. 8 of the response.

***Claim Rejections/Objections Maintained***

In view of the amendment filed on 5/7/09, the following rejections are maintained.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 11-17 stand rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5827641 (Parenteau et al. issued on Oct 27, 1998) in view of US Patent No. 6645715 (Griffith et al. issued on Nov 11, 2003, priority Jan 25, 1999) and US Patent No. 6689165 (issued Feb 10, 2004, priority Mar 31, 2000). The rejection is maintained for the reasons made of record.

Claims 11-17 as amended are drawn to an artificial full thickness or a half full thickness cornea transplant support and/or an artificial cornea transplant consisting essentially of a base biopolymer being incorporated with an attachment reagent comprising one or more the following: laminin, fibronectin, RGDS, bFGF conjugated with polycarbophil, and EGF conjugated with polycarbophil, wherein the biopolymer is molded into the shape of a cornea, with a convex and concave side, seeding or not seeding human corneal endothelial cells onto the convex side of the biopolymer, and suitable for implantation onto a damaged cornea.

On p. 9-13 of the response, Applicant argues that none of the cited references teach a biopolymer in the shape of a cornea, having a concave and convex side, and having growth and attachment factors incorporated within the biopolymer that is suitable for transplantation into a damaged cornea. On p. 5-8 of the response, Applicant argues that instant claims have been amended to recite "consisting essentially of", which does not include other cell types from the cornea. Applicant argues that Parenteau does not teach the claimed corneal transplant support because Parenteau teaches an in vitro corneal model and the teaching of Parenteau is not enabled for in vivo transplantation because no example of surgical implantation is provided and the Parenteau's artificial

cornea has no transparent feature that is required by an in vivo condition. Applicant argues that Griffth teaches an in vitro avascular, human corneal equivalent, comprising immortalized human cell line in a biopolymer support suitable for long term growth of HCEC not a support for a corneal biopolymer support for transplantation into a damaged cornea. Applicant argues that Jacob teaches an ocular device comprising an optical polymer (collagen, polyurethanes, plymethacrylates and other biocompatible polymers for a cornea) attached to a corneal enhancer molecule (growth factors, such as fibronectin, laminin, EGF and others), which is for growth of corneal epithelial cells not the cell type used by Applicant, and the claimed cornea transplant does not include use of tether molecules and the growth factors are not covalently bonded to the stroma. Applicant argues that the applied references do not make the claimed invention prima facie obvious and teach away from the invention because the combined references do not teach each element of the claimed invention and the primary reference Parenteau and Griffith are directed to immortalized human corneal endothelial cells in a biopolymer shaped as a cornea and Jacob teaches away from the claimed invention because Jacob teaches that the growth factors must be covalently bound or tethered to the biopolymer and teaches a different cell type. Applicant further cites *Graham v. John Deere Co., KSR International Co. v. Teleflex Inc., Ex parte Whalen II, In re Keller* in support of the arguments. Applicant's arguments have been fully considered but they are not persuasive.

In response, Applicant cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re*

*Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In this case, first, the recitation of "consisting essentially of" in amended claims is interpreted as "comprising" because the claims have no clear indication what the basic and novel characteristics actually are.

"A consisting essentially of' claim occupies a middle ground between closed claims that are written in a consisting of' format and fully open claims that are drafted in a comprising' format." PPG Industries v. Guardian Industries, 156 F.3d 1351, 1354, 48 USPQ2d 1351, 1353-54 (Fed. Cir.1998). See also Atlas Powder v. E.I. duPont de Nemours & Co., 750 F.2d 1569, 224 USPQ 409 (Fed. Cir. 1984); In re Janakirama-Rao, 317 F.2d 951, 137 USPQ 893 (CCPA 1963); Water Technologies Corp. vs. Calco, Ltd., 850 F.2d 660, 7 USPQ2d 1097 (Fed. Cir. 1988). For the purposes of searching for and applying prior art under 35 U.S.C. 102 and 103, absent a clear indication in the specification or claims of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." See, e.g., PPG, 156 F.3d at 1355, 48 USPQ2d at 1355. See MPEP § 2111.03 [R-3].

With regard to Applicant's argument that the applied references teach away from the claimed invention, the examiner asserts that applied references do not teach away from the claimed invention and do teach each elements recited in the claims and thus render the claimed invention obvious. Briefly, Parenteau teaches an artificial cornea transplant support and an cornea equivalent comprising endothelial cells seeded on membranes made of biopolymer including collagen IV and coated with heparin and heparin-binding growth factor-1. Parenteau teaches the cornea equivalent (i.e. an artificial cornea transplant) comprising an inner endothelial cell layer, a middle stromal cell-collagen mixture layer and an external epithelial cell layer (see col. 14, claims 1-16; in particular) for cornea transplantation and also teaches the endothelial cells can be derived from different sources including different cornea endothelial cells and non-corneal endothelial cells derived from human (see col. 5, lines 1-5; col. 5, line 61-col. 6,

line41; col. 8, lines 44-67, in particular). As previously made of record, since Parenteau's cornea equivalent encompasses the structures and cell layers of the real cornea and is used for transplantation, the thickness of the cornea equivalent is a full-thickness artificial cornea transplant as recited in instant claims 11 and 13 (see col. 10, lines 1-25, in particular) and the shape is also a desired shape of a cornea as recited in instant claim 11. Parenteau teaches that the endothelial cells are seeded onto membranes of a cell culture insert consisting of polystyerene, polycarobonate, polypropylene or collagen (including types I, III-VII and XII), cellulose, glass fiber or other biocompatible polymer, which encompass collagen IV as recited in instant claim 12 and non-swelling biopolymer as recited in instant claim 17 (see col. 5, lines 21-60; col. 6, lines 50-65, in particular). Parenteau also teaches that the endothelial cells can be transformed and derived from different sources including human cornea endothelial cells (see col. 5, lines 1-5; col. 5, line 61-col. 6, line41; col. 8, lines 44-67, in particular). Moreover, Parenteau teaches different thickness of the cornea equivalent for ocular wound healing, which is not full-thickness (see col. 10, lines 1-25, in particular).

Although Parenteau does not explicitly teaches the use of human corneal endothelial cells in the corneal transplant as in claims 13 and 14, Griffith teaches corneal endothelial cells in the corneal transplant can be derived from human (see col. 15-16). Although Parenteau does not teach a half full-thickness as recited in instant claims 14-16 and also does not teach laminin, RGDS, FGF or EGF-conjugated with polycarbophil as recited in instant claims 11, 13 and 14, Griffith teaches artificial cornea transplant supports or artificial cornea transplants with different thickness comprising a

base biopolymer with laminin, fibronectin, RGDS, bFGF conjugated with polycarbophil, EGF conjugated with polycarbophil or heparin sulfate seeding human corneal endothelial cells onto the biopolymer as recited in instant claims 11-17 (see col. 19-24). Griffith teaches an artificial mammalian cornea comprising an endothelium, a stromal matrix, an epithelium and at least one layer of Bowman's or Descemet's membrane (see col. 19-24; col. 12, lines 18-55; col. 19-22; col 26, claims 1-22). The teaching of Griffith is an artificial mammalian cornea so the shape is the shape of a cornea with a convex and a concave side. In addition, Jacob teaches that different adhesion attachments such as laminin, fibronectin, integrin, RGDS, FGF, EGF, and TGF-b, can be used in a synthetic device for cornea augmentation or replacement to increases corneal epithelium cell adhesion (see abstract; col. 12-19; col. 19-20, claims 1-18, in particular). Griffith and Jacob teach an artificial mammalian cornea for corneal transplantation so the shape is the shape of a cornea with a convex and a concave side and thus the endothelial cells are on the convex side of the biopolymer.

It would have been obvious to a skilled artisan to use human corneal endothelial cells and different attachment agents in the artificial cornea transplant/transplant support disclosed by Parenteau to make a different thickness or a half full-thickness artificial cornea transplant because human corneal endothelial cells and different attachment agents have been successfully to be used for making a full or half-thickness artificial cornea transplant as taught by Griffith and Jacob. Note that

"The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945)". See MPEP § 2144.07.

In addition,

"It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980); see also *In re Crockett*, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) and *Ex parteQuadranti*, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992). See MPEP § 2144.06.

With regard to Applicant's argument that the reference of Parenteau is not enabling because no example of showing in vivo transplantation and no transparent feature in the Parenteau's artificial corneal transplant support are provided, the examiner asserts that the prior art reference of Parenteau is enabling for the instant claims. It is noted that Parenteau does the claimed artificial corneal transplant support for transplantation to a damaged cornea (see col. 9-10, in particular). In addition, Parenteau also teaches that although the in vitro corneal model is not transparent, the transparent feature is expected because the endothelial cells within the transplant support or construct will regulate and generate collagens and glycosaminoglycans for corneal clarity. Note that a prior art of an issued US patent is a reference containing an "enabling disclosure" that the public was in possession of the claimed invention before the date of invention. In *In re Donhue*, the court held that

"Such possession is effected if one of ordinary skill in the art could have combined the publication's description of the invention with his [or her] own knowledge to make the claimed invention." *In re Donohue*, 766 F.2d 531, 226 USPQ 619 (Fed. Cir. 1985). See MPEP 2121.01

In addition, based on MPEP, an actual working example is not required for compliance with the enablement requirement of 35 U.S.C. 112, first paragraph.

"An example may be 'working' or 'prophetic.' A working example is based on work actually performed. A prophetic example describes an embodiment of the invention based on predicted results rather than work actually conducted or results actually achieved."

and also In *in re Borkowski*, the court held that

"The specification need not contain an example if the invention is otherwise disclosed in such manner that one skilled in the art will be able to practice it without an undue amount of experimentation. *In re Borkowski*, 422 F.2d 904, 908, 164 USPQ 642, 645 (CCPA 1970). See MPEP § 2164.02.

Furthermore, Applicant's argument with regard to covalently bound or tethered to biopolymer is irrelevant because as long as the growth factor or attachment used in Jacob's artificial cornea is identical to the instant growth factor or attachment, the mechanisms of how the molecule is bound to the surface is intrinsic.

7. Claims 11-17 and 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5827641 (Parenteau et al. issued on Oct 27, 1998) in view of US Patent No. 6645715 (Griffith et al. issued on Nov 11, 2003, priority Jan 25, 1999) and US Patent No. 6689165 (issued Feb 10, 2004, priority Mar 31, 2000) as applied to claims 11-17 above, and further in view of Thomson et al. (Biomaterials. 1991, 12: 37-40).

Claims 11-17 and 27-28 as amended are drawn to an artificial full thickness or a half full thickness cornea transplant support and/or an artificial cornea transplant consisting essentially of a base biopolymer being incorporated with an attachment reagent comprising one or more the following: laminin, fibronectin, RGDS, bFGF conjugated with polycarbophil, and EGF conjugated with polycarbophil, wherein the biopolymer is molded into the shape of a cornea, with a convex and concave side, seeding or not seeding human corneal endothelial cells onto the convex side of the

biopolymer, suitable for implantation onto a damaged cornea and wherein the biopolymer is coated with diamond like carbon.

US Patent No. 5827641, US Patent No. 6645715 and US Patent No. 6689165 are as set forth above but fail to teach the biopolymer is coated with diamond like carbon.

Thomson et al. teach that diamond like carbon is inert and elicits no toxic or inflammatory response in cells, macrophages, and fibroblasts grown on its surface. Thomson et al. teach that biopolymers of an implant coated with diamond like carbon can improve the biocompatibility of the implant and thus the diamond like carbon coating is suitable for biomedical use (see p. 37 & abstract; p. 40, in particular).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Thomson to coat the biopolymer in the artificial corneal transplant support with diamond like carbon. The person of ordinary skill in the art would have been motivated to do so with an expectation of success because diamond like carbon coating is inert and can improve biocompatibility of the implant in biomedical use and thus to improve the artificial corneal transplant in the corneal transplantation.

***Conclusion***

8. NO CLAIM IS ALLOWED.

9. Any inquiry of a general nature or relating to the status of this general application should be directed to the Group receptionist whose telephone number is (571) 272-1600.

Papers relating to this application may be submitted to Technology Center 1600, Group 1649 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). Should applicant wish to FAX a response, the current FAX number for Group 1600 is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chang-Yu Wang whose telephone number is (571) 272-4521. The examiner can normally be reached on Monday-Thursday from 8:30 AM to 6:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Stucker, can be reached at (571) 272-0911.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/CYW/
Chang-Yu Wang, Ph.D.
August 5, 2009

/Christine J Saoud/
Primary Examiner, Art Unit 1647